IMPROVED NAVY LIGHTERAGE THROUGHPUT MODELING AND SIMULATION TOOL

JOINT SEABASED THEATRE ACCESS WORKSHOP

FEBRUARY 9-10 2005

PURPOSE

- Develop a modeling tool to support INLS OPEVAL
- Include latest MPSRON load plans and squadron remix
- Supplement to Operational Testing
- Provide a tool to measure environmental conditions effect
- Develop IAW SECNAV 5200.40A
- Validation and Verification required
- Certification by Program Manager and OPTEVFOR
- Transition as Fleet tool for training, exercises, operations

INLS Capabilities Analysis Tool (ICAT)

STATEMENT OF WORK

- **Develop an INLS throughput modeling tool that will allow the planner to examine the dynamics of INLS Developmental Testing and Operational Testing.**
  - **Identify possible bottlenecks and problems**
  - **Assess the impact of a dynamic event**
  - **Plan contingencies for use during execution**
  - **Reduce time required for Developmental and Operational Testing**
  - **Transition to a tool for the operating forces**

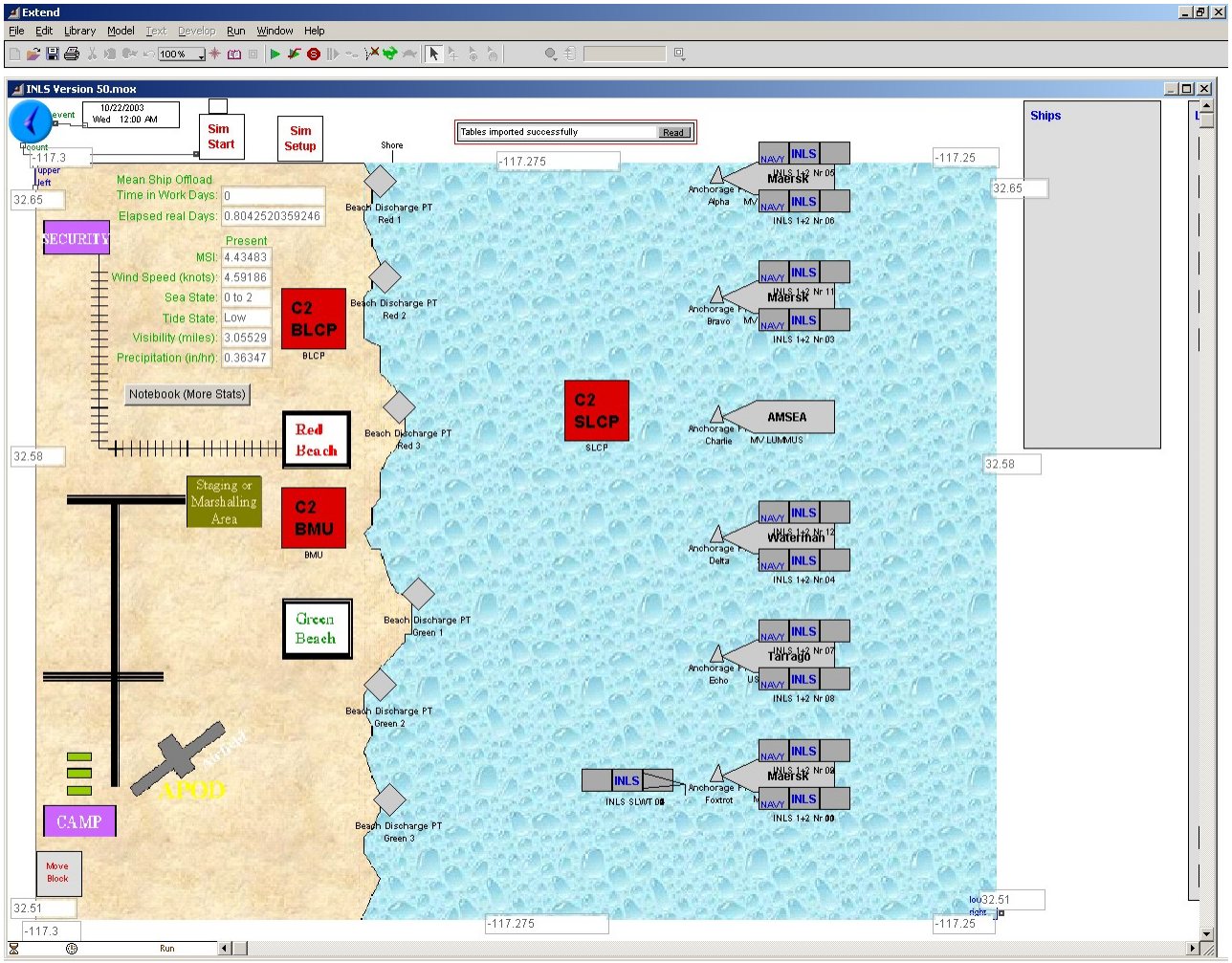
INLS Capabilities Analysis Tool (ICAT)

- MS Windows-based
- Provides a modeling and simulation capability to provide system engineering insight across flows. It consists of:
  - A simulation engine
  - Libraries of graphical elements of integrated spreadsheet and project management tools (for timeline analysis), and
  - MS Access Database
- Visualization for easy understanding and presentation
- Discrete Event Simulation of INLS offload timeline
- Algorithms are visual and do not require an understanding of a computer software language
- No license or fee for runtime version of TopView

Specifics of the ICA Tool

- Developed using Extend/TopView modeling and simulation tool
- Map area established by entering latitude and longitude of map corners.
- Each element has a Lat/Long location for computing distance from other elements.
  - Elements are updated after they move.
- Inventory represents the available elements that can be used in the model.
- Lighterage and Ships can be activated from inventory and deactivated back to inventory before a simulation run.
- Performance measures are computed by the simulation
- Multiple Trial Monte Carlo Execution for Metrics Data Collection

ICAT


Extend
File Edit Library Model Text Develop Run Window Help
INLS Version 50.mox
Sim Start
Sim Setup
Tables imported successfully
Read
Ships
Mean Ship Offload
Time in Work Days: 0
Elapsed real Days: 0.8042520359246
Present
MSI: 4.43483
Wind Speed (knots): 4.59186
Sea State: 0 to 2
Tide State: Low
Visibility (miles): 3.05529
Precipitation (in/hr): 0.36347
Notebook (More Stats)
SECURITY
C2 BLCP
BLCP
Red Beach
C2 SLCP
SLCP
C2 BMU
BMU
Staging or Marshalling Area
Green Beach
APOD
CAMP
Move Block
Beach Discharge PT Red 1
Beach Discharge PT Red 2
Beach Discharge PT Red 3
Beach Discharge PT Green 1
Beach Discharge PT Green 2
Beach Discharge PT Green 3
Anchorage Alpha
Anchorage Bravo
Anchorage Charlie
Anchorage Delta
Anchorage Echo
Anchorage Foxtrot
Maersk
AMSEA
MV LUMMUS
Waterman
Tarrago
INLS 1+2 Nr 06
INLS 1+2 Nr 11
INLS 1+2 Nr 03
INLS 1+2 Nr 12
INLS 1+2 Nr 04
INLS 1+2 Nr 07
INLS 1+2 Nr 08
INLS 1+2 Nr 09
INLS SLWT 08
-117.3
-117.275
-117.25
32.65
32.58
32.51
Run

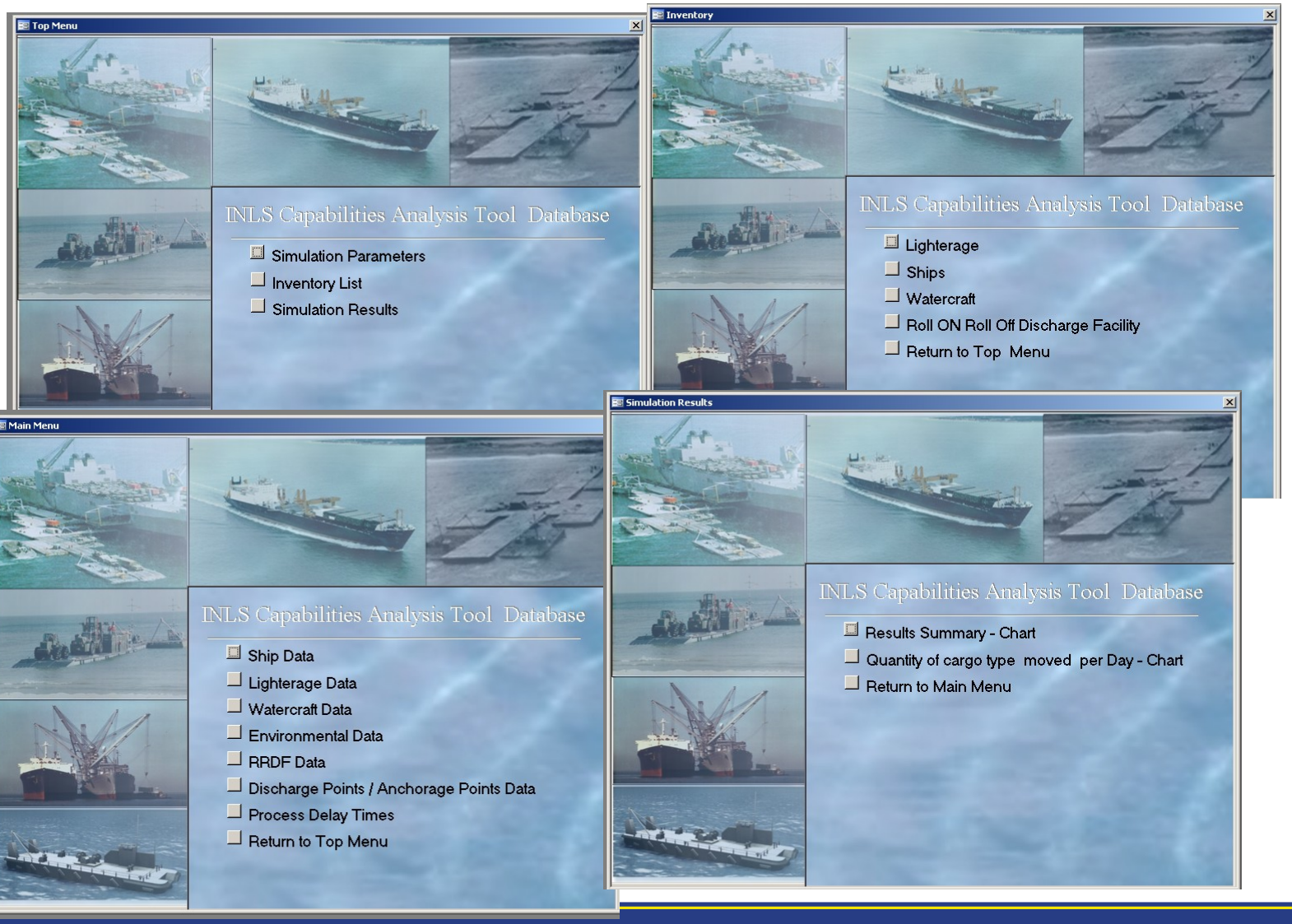
Algorithms and Capabilities

- Distance between locations
- Current Direction and Speed
- Maintenance Downtime
- Casualties
- Anchorage Point selection
- Pairing RRDF with Watercraft
- Matching RRDF to ship
- Matching lighterage to ship
- Matching lighterage to discharge point
- Cargo Transfer LO/LO, RO/RO
- Beach Cargo Transfer
- Beach Gradient
- Visibility
- Precipitation
- Sea State
- Modified Surf Index (MSI)
- Tide
- Movement of ships and lighterage
- Beach Point Selection
- Cargo type (Tracked and Wheeled Vehicles and Containers)

Data Base

- MS Access
- All simulation data parameters can be changed in MS Access not in the model.
- Changing data values
  - Cargo Quantities
  - Cargo Transfer Rate
  - Environment
  - Capacities
- Reviewing data
- Data Collection for Performance Measure calculation.

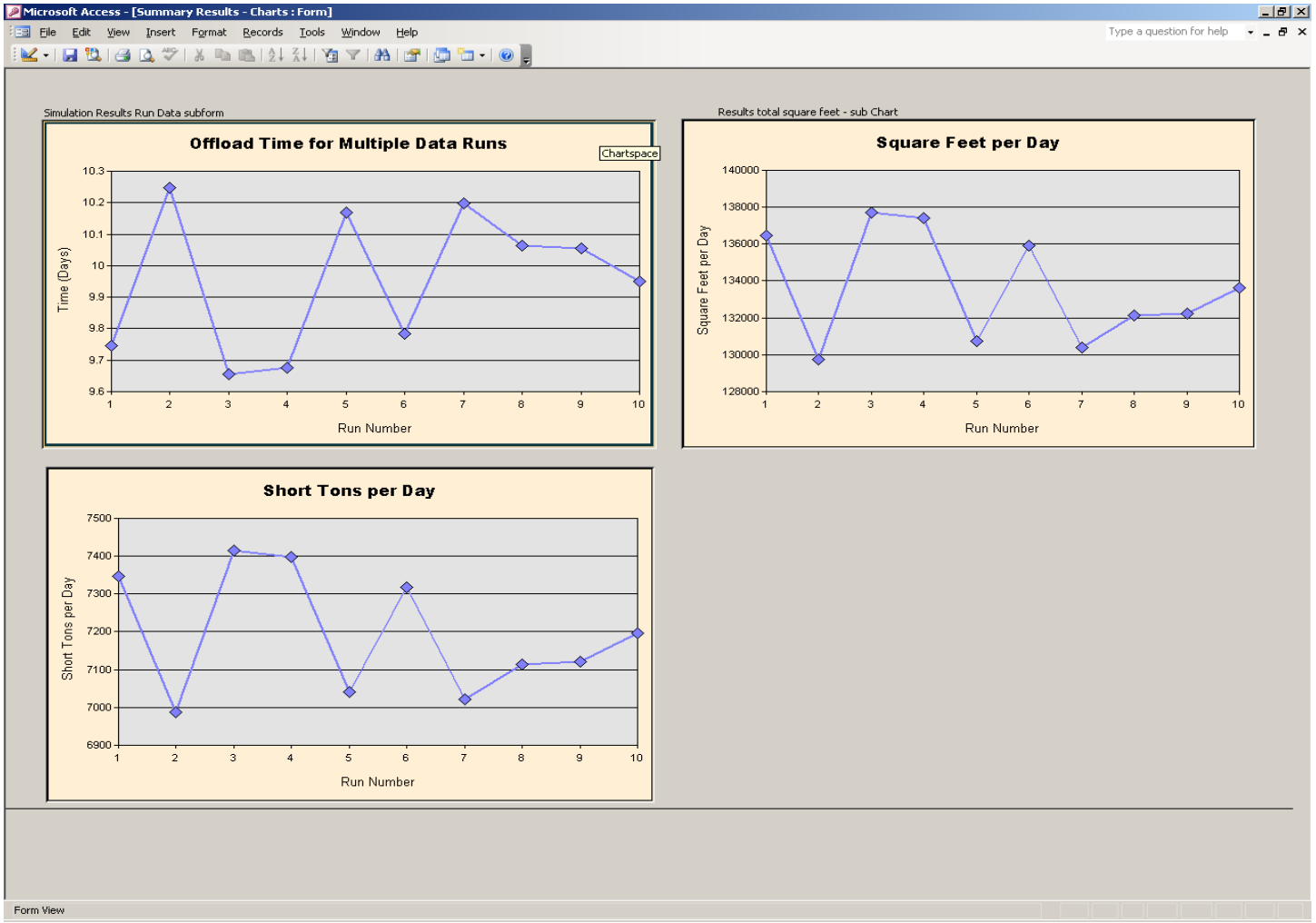
Database


Top Menu
INLS Capabilities Analysis Tool Database
Simulation Parameters
Inventory List
Simulation Results
Inventory
INLS Capabilities Analysis Tool Database
Lighterage
Ships
Watercraft
Roll ON Roll Off Discharge Facility
Return to Top Menu
Main Menu
INLS Capabilities Analysis Tool Database
Ship Data
Lighterage Data
Watercraft Data
Environmental Data
RRDF Data
Discharge Points / Anchorage Points Data
Process Delay Times
Return to Top Menu
Simulation Results
INLS Capabilities Analysis Tool Database
Results Summary - Chart
Quantity of cargo type moved per Day - Chart
Return to Main Menu

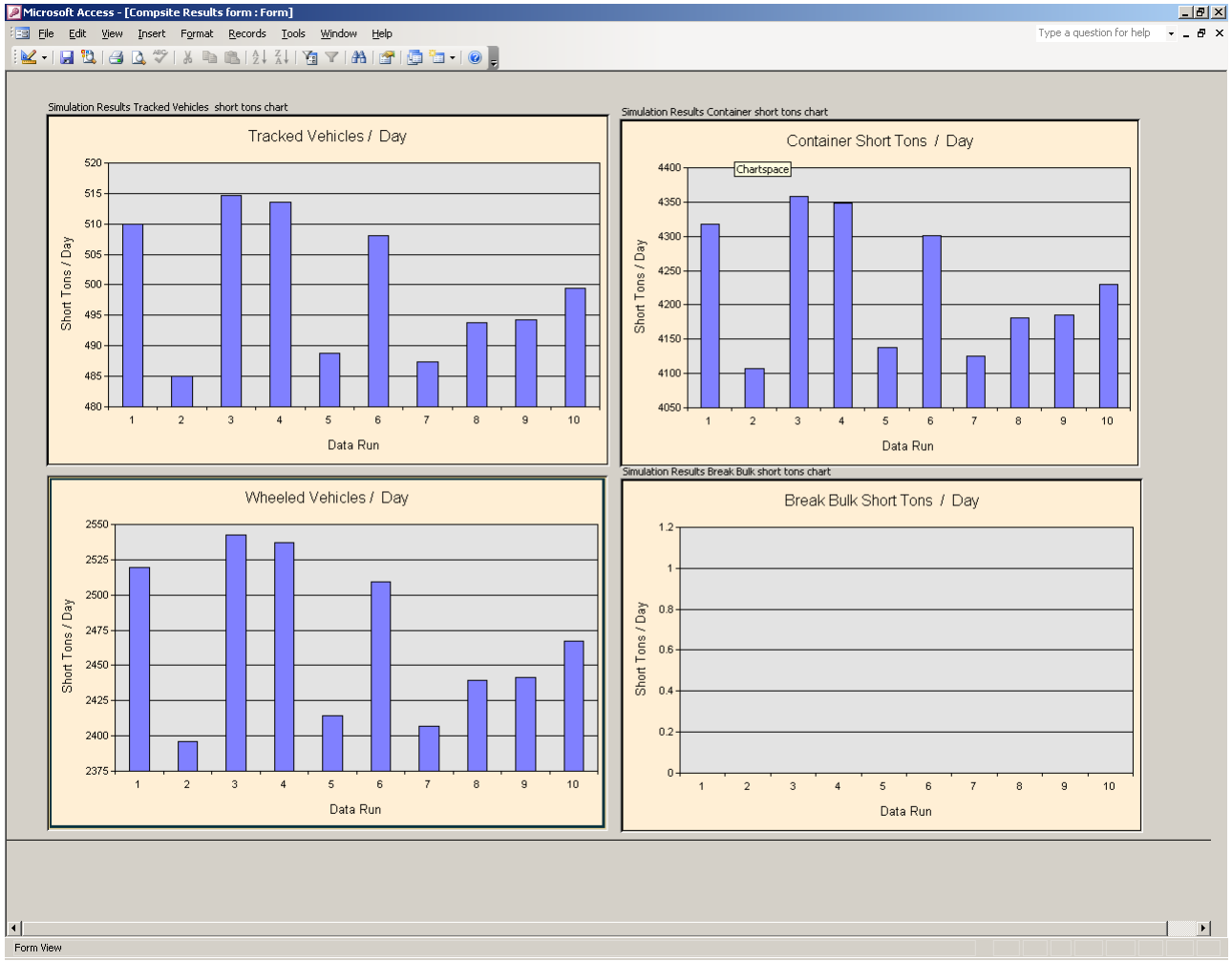
Performance Measures

- Throughput Time to offload all ships
- Short Tons per hour
- Square Feet per hour
- Ship offload rate
- Some data collected during a run displayed in the Notebook

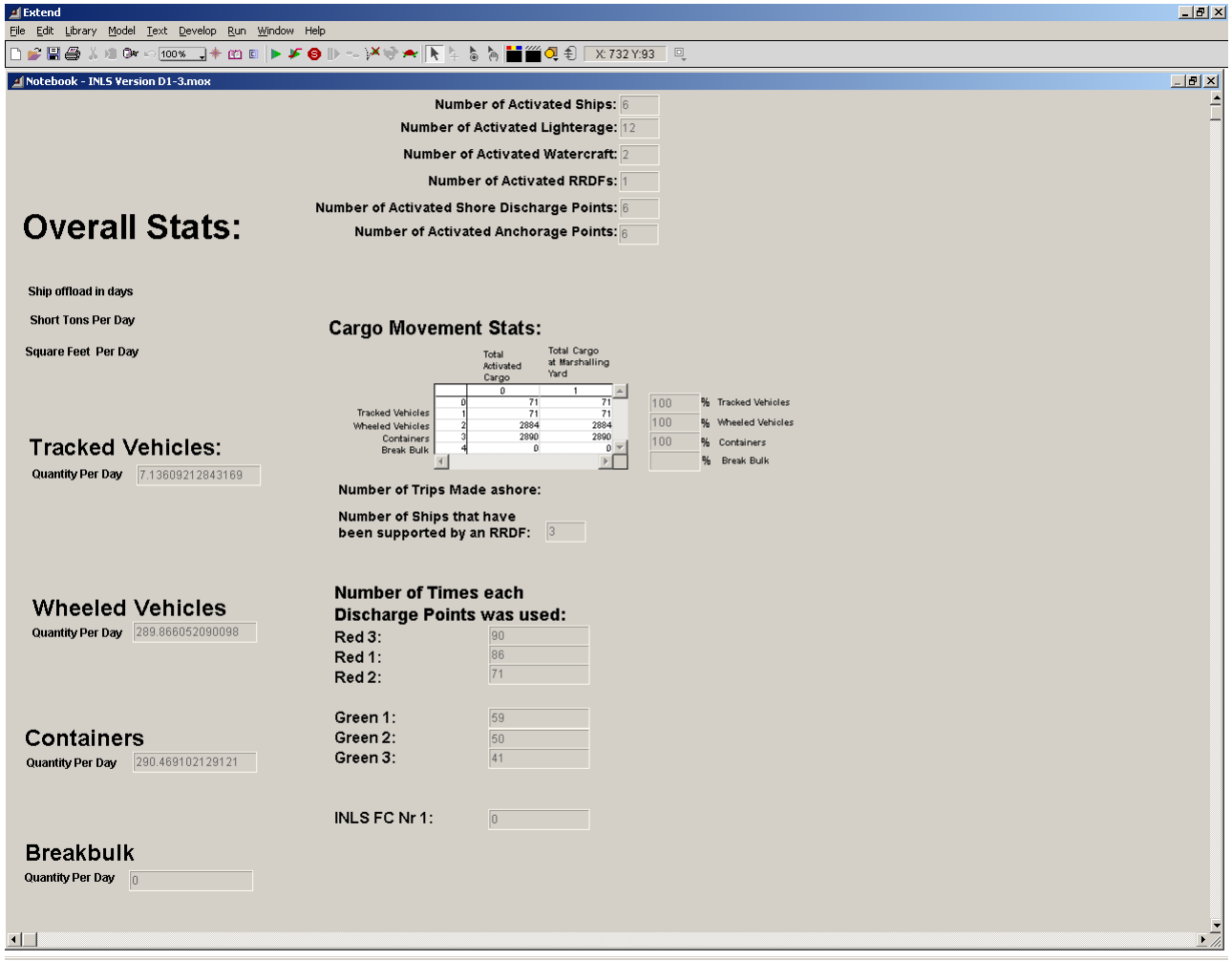
Mean Throughput and Standard Deviation


Microsoft Access - [Summary Results - Charts : Form]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Simulation Results Run Data subform
Offload Time for Multiple Data Runs
Chartspace
Time (Days)
Run Number
Results total square feet - sub Chart
Square Feet per Day
Square Feet per Day
Run Number
Short Tons per Day
Short Tons per Day
Run Number
Form View

Rates by Cargo Type


Microsoft Access - [Compsite Results form : Form]
File Edit View Insert Format Records Tools Window Help
Type a question for help
Simulation Results Tracked Vehicles short tons chart
Tracked Vehicles / Day
Short Tons / Day
Data Run
Simulation Results Container short tons chart
Container Short Tons / Day
Chartspace
Short Tons / Day
Data Run
Wheeled Vehicles / Day
Short Tons / Day
Data Run
Simulation Results Break Bulk short tons chart
Break Bulk Short Tons / Day
Short Tons / Day
Data Run
Form View

Notebook


Extend
File Edit Library Model Text Develop Run Window Help
Notebook - INLS Version D1-3.mox
Number of Activated Ships: 6
Number of Activated Lighterage: 12
Number of Activated Watercraft: 2
Number of Activated RRDFs: 1
Number of Activated Shore Discharge Points: 6
Number of Activated Anchorage Points: 6
Overall Stats:
Ship offload in days
Short Tons Per Day
Square Feet Per Day
Cargo Movement Stats:
Total Activated Cargo
Total Cargo at Marshalling Yard
Tracked Vehicles 0 71 71
Wheeled Vehicles 1 71 71
Containers 2 2884 2884
Break Bulk 3 2890 2890
4 0 0
100 % Tracked Vehicles
100 % Wheeled Vehicles
100 % Containers
% Break Bulk
Tracked Vehicles:
Quantity Per Day 7.13609212843169
Number of Trips Made ashore:
Number of Ships that have been supported by an RRDF: 3
Wheeled Vehicles
Quantity Per Day 289.866052090098
Number of Times each Discharge Points was used:
Red 3: 90
Red 1: 86
Red 2: 71
Green 1: 59
Green 2: 50
Green 3: 41
Containers
Quantity Per Day 290.469102129121
INLS FC Nr 1: 0
Breakbulk
Quantity Per Day 0

Questions